Time Value of Money

"A dollar you receive today is worth more than a dollar you will receive in a year!"

Time Value of Money

- Face value = The "nominal" value of money
  - What is printed on it
  - The raw amount quoted for a price/product, etc
  - Also known as PRESENT value

- Time value = The "future" value of money when earning interest
  - Similar to "real" value, but has not yet been determined

Time Value Formula

- $PV = FV / (1 + r)^n$

PV = Present Value

FV = Future Value

r = Interest Rate (expressed as .XX)

n = Number of compounding periods (years)

Time Value Formula Example

I need $500 in a savings account in 3 years. I find an account paying 4% interest. How much do I need to put in to make this happen?

- $PV = FV / (1 + r)^n$
- $PV = 500 / (1 + .04)^3 = \$444.50.$
- I need to put $444.50 in TODAY (present value) to get $500 in future value.
- NOTE: the interest rate is in the denominator of the forumula and, therefore, INVERSELY related to present value!

So? Who cares?

- Businesses care…A LOT.
- Businesses must make decisions on investments based on future valuations and real return on investments

Donald Thompson, CEO McDonalds

Example from 4-2

- An arcade is going to borrow $2000 to buy this machine

- They expect the machine to generate future profits of **$1000** the first year and **$1,400** the second year and then be completely worthless

Example from 4-2

- The bank charges the company a nominal interest rate of 9% Should the business borrow the machine?

- $PV = FV / (1 + r)^n$
- $PV = 1000/(1.09)^1 + 1400/(1.09)^2 =$ **$2,095.78**

- This means the value of their $2000 will be $2,095.78. **Ceteris paribus***, this is a wise investment.

- *Inflation and opportunity costs will be considered in real life!

Example from 4-2

- What if the interest rate changes to 15%?

- $PV = FV / (1 + r)^n$
- $PV = 1000/(1.15)^1 + 1400/(1.15)^2 =$ **$1928.17**

- This means the FUTURE value of their $2000 will be $1928.17 after they pay their loan with interest. This is NOT a wise investment.

Bond Market

- Initial treasury bonds issued by US Treasury Department
- Once they are issued, they are bought/sold on the bond market (open market)
- Bond's typically issued for long periods of time
- People may need cash before the bond "matures" creating a need to sell

Buys this $1,000 bond

- He earns 5% a year on his bond. ($50 in this case)
- When the bond matures, he gets his $1,000 back.

Then this happens...

...and he needs cash **now.**

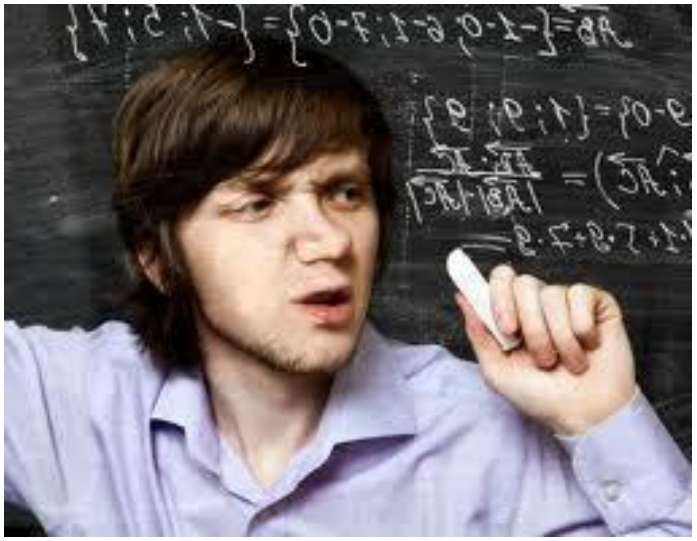
- He should sell his bond right?
- When he goes to sell his bond, however, he learns that $1,000 bonds are now selling for 7% interest!
- Why would anyone want to buy his bond for 5% interest?

He tries to complain…

- Batman is right, but by how much?

Pricing a bond

- Let's assume the guy has 2 years left before the bond reaches maturity.
- That means this year the bond will pay $50 and next year, the bond will pay $50 PLUS the original $1000.
- Now we know the future values, the interest rate (7%) and the time frame – sounds like everything we need for…



Time Value Formula

- $PV = FV / (1 + r)^n$
- $PV = 50/(1 + .07)1 + 1050/(1+.07)2 =$ **$963.84.**
- **He should put his bond on the market for $963.84 cents to compete with the current $1000 bonds.**
- **Why does this work? If someone buys the bond at $963.84, when they get the $1,000 that the bond is WORTH, they will have earned 7% return, which is what bonds are paying.**

Time Value Formula

- Remember, his interest rate is 5%. What happens if bonds are now selling for 3%?
- $PV = FV / (1 + r)^n$
- $PV = 50/(1 + .03)^1 + 1050/(1+.03)^2 =$ **$1067.96**
- **Someone wanting his 5% interest rate, would need to pay MORE for the bond up front.**

BIG TAKEAWAYS!!!!

- ***Bond prices move INVERSELY to interest rates!***

- ***Time value of money important to businesses for investment purposes!***